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fibrin were formed, which had an appearance identical with that of blood-fibrin under the microscope, giving a conclusive proof to my mind that, during the formation of fibrin by the action of oxygen on albumen, a volatile constituent is formed and carried off by the excess of oxygen which passes into the albumen in solution.

The following are the chief physical and chemical properties of the fibrin artificially formed by the action of oxygen on albumen:—

It has a lighter specific gravity than albumen, being always found floating on the surface of the albumen, provided it is free and not entangled or attached to the side of the vessel or platinized platinum wire that has been inserted in the albuminous solution.

It has a fibrinated appearance under the microscope, and is capable of being teased out into filaments in the same manner as blood-fibrin.

Acetic acid completely dissolves it after some time.

Soda and potash cause it to swell up and dissolve. Concentrated solution of ammonia, after the lapse of some hours, causes the fibrin to swell up in a gelatinous mass, similar to that which occurs when blood-fibrin is submitted to the same reagent.

A hot or cold solution of nitrate of potash does not dissolve it when it is digested in that menstruum for some hours.

With Millon's test it becomes of a brick-red colour.

With nitric acid a bright yellow colour became visible.

Fibrin heated with hydrochloric acid gave a blue colour, and subsequently dissolved, giving a blue tint to the liquid.

An acid solution of acetate of lead caused both blood-fibrin and fibrin artificially prepared to swell up and become translucent after digestion for a certain period.

III. " On Diffusion of Vapours : a means of distinguishing between apparent and real Vapour-densities of Chemical Compounds." By J. A. WANKLYN and J. ROBINSON, Esq. Communicated by Dr. FRANKLAND. Received March 10, 1863.

The density of the vapour given off when a chemical compound is heated is not necessarily the *vapour-density* of that chemical com-

pound; sometimes it is only the mean density of the products of decomposition. Some of the best-known substances, such as hydrated sulphurous acid, ammoniacal salts, and pentachloride of phosphorus, suffer decomposition when they are vaporized, and thus have an apparent vapour-density, which is in reality nothing more than the mean density of the products of their decomposition.

We recognize such cases—in which the apparent is not the real vapour-density—by making a diffusion-analysis of the vapours. This method of solving questions of the kind was proposed by one of us two years ago[*]. In carrying it out practically, it was resolved from the first not to diffuse through a porous diaphragm, but to recur to Graham's original method, namely, to let our vapours diffuse through a simple aperture or through a short tube.

Independently of the experimental difficulties attending the use of a porous diaphragm at high temperatures, there is a fatal objection to it, founded upon the inconclusiveness of the results obtained in such a way.

Our resolve to avoid porous substances was not by any means shaken by Pebal's memoir[†] on the diffusion of chloride-of-ammonium vapour through asbestos; for what is more likely than that a finely-divided silicate (a salt of an acid of indefinite capacity of saturation) should decompose ammoniacal salts at elevated temperatures?

The apparatus used in our experiments is of the simplest kind. It is represented in the drawing, and consists of two glass flasks, the necks of which do not fit air-tight: the narrow tube proceeding from the upper one is fused to the flask. The lower flask is for the reception of the vapour to be operated upon; the upper flask is for the atmosphere into which the vapour is to be diffused. The atmo-

[*] Playfair and Wanklyn on Vapour-densities, Transactions of Roy. Soc. of Edinburgh, 1861, vol. xxii. part 3. p. 458. In this paper it was proposed to extend to vapours what had previously been applied to gases. One of the earliest, perhaps the earliest example of a precise diffusion-analysis of a gas was given by Frankland in his research upon the isolation of ethyl (see Quart. Journ. Chem. Soc. vol. ii. p. 285, 1850). After describing his diffusion-apparatus and its use in the case of ethyl, Frankland proceeds, "This method might in almost every case be employed with advantage to determine whether or not any specimen of gas be simple or mixed."

[†] Ann. de Chim. et de Phys. January 1863.

sphere of dry air, or other suitable gas, is kept constantly renewed
by the transmission of a slow stream of gas, which enters the upper
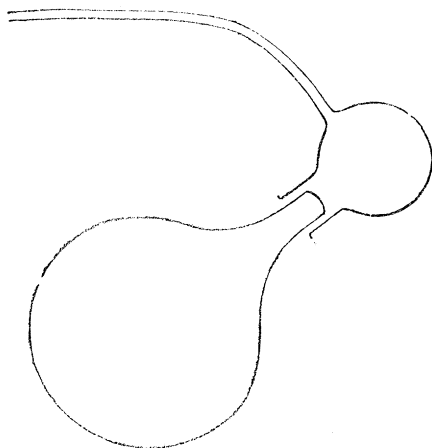
flask by the narrow tube above, and passes out by the space between
the two necks, which, as we have said, do not fit air-tight.   When
in use, the whole apparatus is kept at a temperature above the con-
densing-point of the vapour by means of an air-bath.

After a diffusion has gone on for a sufficient length of time the
apparatus is allowed to cool, and the contents of the lower flask are
analysed, by which means it is seen whether diffusion has effected
any alteration in the composition of the vapour.

We have used a lower flask of about 500 cubic centimetres capa-
city, with a mouth 10 millimetres in diameter; the capacity of the
upper flask was 100 cubic centimetres.

The first substance taken for experiment was sulphuric acid, which
is converted at high temperatures into vapour of sulphuric anhydride
and vapour of water.   Inasmuch as vapour of water is lighter than
vapour of sulphuric anhydride, the former should diffuse more
rapidly than the latter.   Accordingly, the residue after diffusion
should be richer in sulphuric anhydride than the acid before diffusion.

In one experiment we took an acid composed of

        95 Mono-hydrated sulphuric acid.

         5 Water.
        ―――
       100

After diffusion for an hour at about 520° C., the residue was composed of

> 60 Mono-hydrated sulphuric acid.
> 40 Sulphuric anhydride.
> ———
> 100

In another experiment we took an acid containing

> 99 Mono-hydrate.
> 1 Water.
> ———
> 100

and after diffusion for a shorter time at 445° C. found the residue to consist of

> 75 Mono-hydrate.
> 25 Anhydride.
> ———
> 100

In both cases the residues after diffusion fumed strongly on exposure to the air, and consisted partly of crystals and partly of liquid.

The substance next submitted to diffusion was pentachloride of phosphorus, which is decomposed by heat into terchloride and free chlorine.

The pentachloride which we used gave no reaction with iodide of potassium and starch, and therefore contained no free chlorine; it gave no precipitate with corrosive sublimate, and therefore contained no terchloride of phosphorus. An analysis of it gave

> Percentage of chlorine=84·67
> The formula requires... 85·13

In one experiment we diffused into carbonic acid gas* for three-quarters of an hour at about 300° C., and afterwards dissolved the contents of the lower flask in water, and precipitated with corrosive sublimate, with the addition of a little hydrochloric acid. ·0175 gramme of calomel was obtained. In another experiment (also into carbonic acid) the time of diffusion was two hours, temperature 300° C., quantity of calomel obtained ·0285 gramme.

These two results leave no doubt as to the existence of terchloride

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* If pentachloride of phosphorus be diffused into air, the residual terchloride combines with oxygen to form oxychloride of phosphorus, which does not reduce corrosive sublimate.

of phosphorus in the residue after diffusion; for the reduction of corrosive sublimate to calomel cannot be otherwise explained. Moreover, the presence of free chlorine in the diffused gases was shown by the reaction with iodide of potassium and starch.

We are continuing this research, and hope to lay before the Society the results of an examination of the most prominent cases of so-called abnormal vapour-density.

IV. "On a Simple Formula and Practical Rule for calculating Heights barometrically without Logarithms." By ALEXANDER J. ELLIS, B.A., F.C.P.S. Communicated by Dr. NEIL ARNOTT, F.R.S. Received February 23, 1863.

The following formula and table for calculating heights barometrically without logarithms will be found to give the same results as Laplace's formula up to 30,000 feet, and the table can be readily extended if required. Let

L degrees be the mean latitude of the two stations,

$l = 2 \cdot 6257 \cos 2L$, $G = 1 + 0 \cdot 0026257 \cos 2L$,

$R = 20888629$, the number of feet in the earth's radius.

At the lower station.

H feet, its height above the sea, $H'' = H^2 \div R$,

B units of any kind, height of barometer, uncorrected,

B' ,, ,, ,, ,, ,, , corrected,

A deg. Fahr., A' deg. Cent., A'' deg. Reaum., temperature of air,

M ,, ,, , M' ,, ,, , M'' ,, ,, , ,, of mercury.

At the upper station.

h, h'', b, b', a, a', a'', m, m', m'' in the same sense.

Then

$$h - H = \left[52400 \frac{B-b}{B+b} + c - 2 \cdot 35 \cdot (M-m) \right] \cdot \frac{836 + A + a}{900}$$
$$+ \cdot 001 \cdot (h-H) \, l + h'' - H'', \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad \cdot \quad (a)$$

where $M - m = 0$, when B, $b = B'$, b', and

$$2 \cdot 35 \, (M-m) = 4 \cdot 23 \cdot (M'-m') = 5 \cdot 29 \cdot (M''-m'')$$
$$\frac{836 + A + a}{900} = \frac{500 + A' + a'}{500} = \frac{400 + A'' + a''}{400}.$$

The numbers c, l, h'', H'' are to be taken from the table on the next page, as will appear by the following examples.